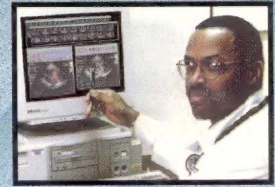


HP Professional

APRIL 1996

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UNRAVELING THE MYSTERIES OF HSM



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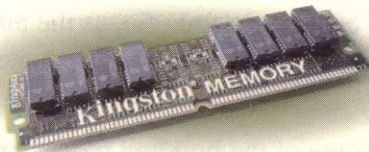


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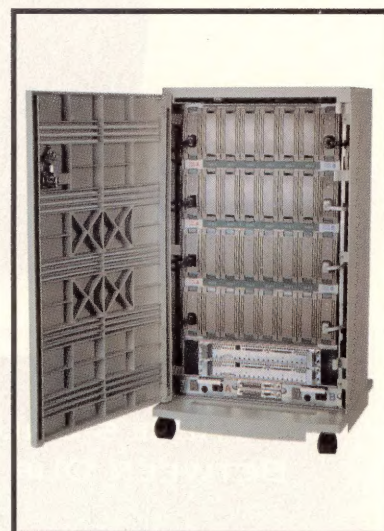
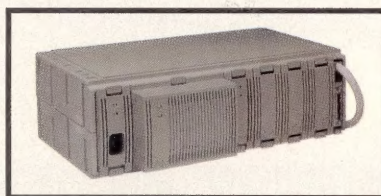
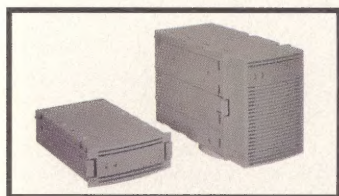
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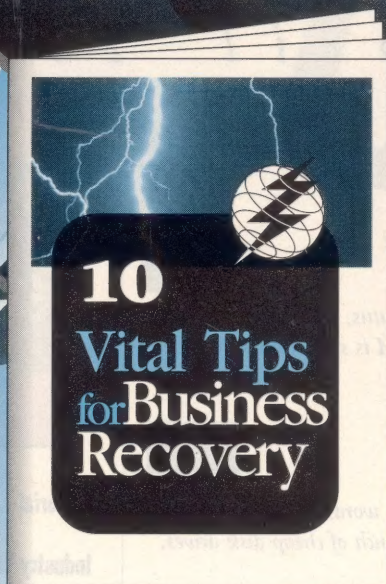
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Engineers Of Fortune

It's that time of year when press releases start mounting up, trade shows abound, and speculation and rumors run rampant. Speaking of which, have you heard the latest NT rumor that is flying about the various online discussion and user groups, as well as among the third-party vendor community? No? How about that the HP 3000 will soon be named an NT Server? Piqued your interest?

Sorry, that's all it is at this point — a rumor. Most analysts and management at HP have denied the story and described it as being pretty "whacky." But if it turns out to be true, remember you read it here first. So what is happening at HP and in the computer market in general? One thing's for sure, there's a lot going on and its happening fast. And not surprising, it is all good news — at least for HP. Anyone who reads my editorials knows I'm not an HP cheerleader, but it seems like HP is making all the right moves.

HP systems continue to gain ground in user popularity and performance. And in case you missed it, the nice guys and gals at HP were named *Forbes'* "Performer of the Year" for 1995, edging out GE, Intel, Wells Fargo, American International Group and Johnson&Johnson. The big news, however, comes on the UNIX side. According to the Aberdeen Group's (Boston, Mass.) 1995 "Commercial, Multiuser Risc/Unix" market review, HP now has a 49 percent share of the UNIX RISC-based worldwide commercial server market. If you're counting, that's \$7 billion or a 57 percent growth rate.

In case your wondering, the market segment as a whole showed a 43 percent increase which amounted to over \$14 billion for 1995. IBM showed a 45 percent growth rate, and retained a 19 percent share. Sun remained in third at 9 percent and showed a growth rate of 35 percent. Fourth place was taken by Siemens Nixdorf Information Systems at 6 percent, and fifth place was taken by Data General at 4 percent. The highest growth came from Digital at an impressive 73 percent. But because it is growing from a small base, its total revenues of \$475 million left it with a sixth-place 3 percent market share, according to the review. Aberdeen predicts that the market for commercial multi-user RISC/UNIX systems will continue to grow at a 40 percent plus rate in 1996, especially with the numerous applications introduced last year. You can be sure that HP will continue to gain as well, as IS managers standardize on one RISC/UNIX platform across the enterprise.

The transition to HP-UX 10 highlights other good news. While not every site has gone as smoothly as planned, HP, for the most part, has kept good on its promise to make upgrading as painless as possible. On the IS/IT side, The Boston Research Group (Boston, Mass.) reported in a recent study that lack of in-house expertise to integrate and maintain 32-bit PC-based operating systems is the top concern among information technology managers. According to the 200 managers surveyed, however, this concern won't prevent the massive purchase of new systems over the next 18 months. Also listed in the survey was the importance of consistent worldwide support. In fact, 83 percent of those surveyed said it was "critical or very important." Other items considered important were adequate infrastructures to provide services (71 percent) and multivendor support (66 percent). HP views these opinions and numbers as positive, and rightly so. Having set the model for worldwide partnering, HP is in a strong position to meet the needs of corporate IS.

So the Boy Scouts have matured. Like Engineers of Fortune, they have ingeniously planned their strategic advances and implemented them with tactical efficiency. HP customers are obviously responding. And by now, even skeptical IS/IT managers must know that means HP continues to be a safe investment.

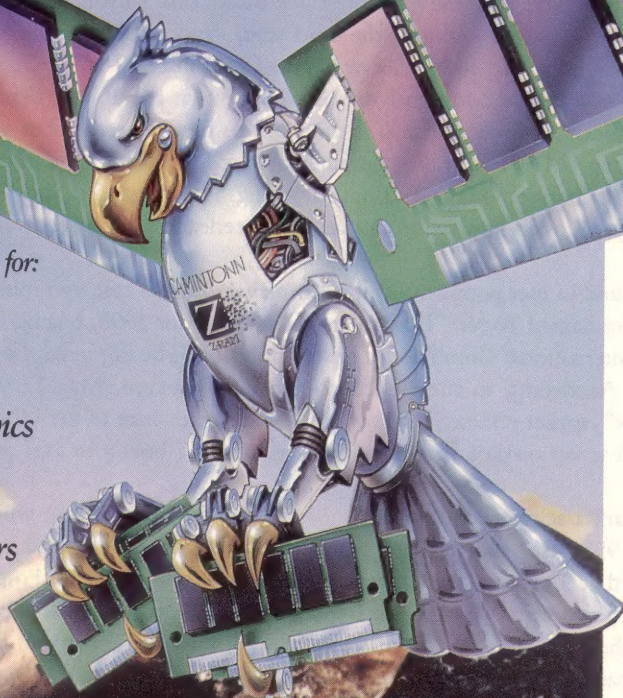


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INDUSTRY WATCH

George A. Thompson

HP-SCO UNIX STREAM FLOWS
MORE WAYS THAN ONE

At Uniforum in San Francisco, HP and the Santa Cruz Operation (SCO; Mountain View, Calif.) announced a "next-generation UNIX system *technology stream* that will form the basis of distributed UNIX for the next decade." The technologies that come out of the HP-SCO joint development will "flow into HP-UX as well as SCO's operating system line," according to Scott McGregor, SCO's senior vice president for products. According to Rich Sevcik, vice president and general manager of HP's Systems Technology Group, "we're simplifying porting, software development and systems management for OEMs, ISVs and end users."

Although it was widely reported in the trade press as a single unified 64-bit UNIX OS, "that's wrong," states McGregor in an exclusive *HP Professional* interview. Consequently, HP-UX and SCO's OpenServer will continue to be available for the foreseeable future. SCO, in fact, is consolidating its OpenServer and UnixWare (recently acquired from Novell) OSes into a high volume Intel-based UNIX OS beginning in 1997. Code-named Gemini, it will also include certain features of HP-UX.

Another misperception according to McGregor is that the development pertains primarily to Intel CPU-based platforms. While he admits that HP and SCO are primarily focused on Intel, "we will support other platforms through other partners." In fact, NEC has already announced plans to port the technology to MIPS-based platforms. NEC is also part of HP's Precision RISC Organization (PRO), which has also announced their support. PRO members include Allegro Consultants Inc. CS (France), CPI Inc., Hitachi

Ltd., Information Builders Inc., Innovus Inc., Interex Corp., Kelly Computers Inc., Mitsubishi Electric Corp., OKI Electric Industry Co., Oracle Corp., Rational Software Corp., Samsung Electronics Co., Stratus Computer Inc., Winbond Electronics Corp., Wind River Systems Inc. and Yokogawa Electric Corp.

The foundation of the new technology is called the 3Dimension Architecture (3DA), for the three (OS design) dimensions that it includes — modular functionality, processor optimization and system optimization. As an example, McGregor cites Windows NT as a one dimensional OS, "because it just has the processor or hardware optimization layer." Full support for the 32- and 64-bit extension to the Single UNIX system specification standard is expected to be delivered in 1997, starting with the first shipments of the Intel Merced CPUs. The new HP-SCO technology will be developed using ASPEN, the 64-bit UNIX standard API. ●

AN HP OPEN VIEW OF
THE ENTERPRISE

After consolidating all of its computer divisions last year under Rick Belluzzo (see our interview with Rick Belluzzo in the November 1995 issue), HP, once shy about showing any kind of support for Microsoft Windows products, is now deadly serious these days about integrating UNIX and Windows environments — especially in an HP sort of way.

The first week in March, HP launched a three-pronged strategy for managing Windows NT-based (and Novell) LANs with HP's OpenView. The CSO-wide initiative included virtually every HP computer division — the Network & System Management Division (NSMD), Software Services

OpenView Products Supporting Windows NT	Scheduled Availability
Network Node Manager for Windows NT	second half of 1996
PerfView for Windows NT	second half of 1996
NetMetrix for Windows NT	second half of 1996
OmniBack II for Windows NT	second half of 1996
IT/Operations for Windows NT	statement of direction
IT/Administration for Windows NT	statement of direction

and Technology Division (SST), OpenView Operation (OVO) NetMetrix Network Server Division, Grenoble Personal Computer Division (GPCD) and the Roseville Networks Division (RND).

The announcement included: new Windows NT- and Novell NetWare-based agents for HP's IT/Operations, IT/MeasureWare, IT/Administration, OpenSpool and OmniBack II, its enterprise management products; complete Windows NT support for HP PerfView, IT/Operations, IT/Administration and OmniBack II, as well as HP OpenView Network Node Manager (NNM); and Novell- and Symantec-supplied HP OpenView integration solutions.

"The OpenView installed base has been eagerly awaiting an announcement concerning NNM on NT for some time," says Jill Huntington-Lee, a senior analyst at Datapro Information Services (Delran, N.J.). "But it's still not happening fast enough." Overall (see chart above), Lee notes that while HP is ahead of Sun when it comes to Windows NT support, its Windows

NT support for OpenView is behind Digital's PolyCenter NetView on NT, which shipped about a year ago. "HP is still behind the curve when it comes to meeting customer demand for availability." ●

HP'S CORPORATE INTRA-DUCTION

Continuing its aggressive push to satisfy the demand for intranets, HP announced a marketing alliance with ANS (Reston, Va.), an Internet Service Provider (ISP). Called the Managed Intranet Solutions or MIS service, it will be sold jointly with HP's Internet Group and ANS, a subsidiary of America Online (AOL). While HP will provide its HP 9000 server product line and support from HP's Professional Services Organization (PSO), ANS will provide its 45 Mbps network infrastructure (including dedicated nationwide access at speeds up to T3 and dial-up V.34 access) as the principal backbone.

Another part of HP's Internet strate-

gy (see Industry Watch, March 1996) became apparent when HP announced the signing of a definitive agreement to acquire Internet/World Wide Web security technology from SecureWare Inc. (Atlanta, Ga.). Built on a so-called "trusted operating system," it permits sensitive transaction data to be transmitted over the Web. The trusted operating system provides mandatory access control, networking security, and improved audit and log-in capabilities which meet the highest level of U.S. government certification.

HP will acquire a substantial, but undisclosed portion of SecureWare's assets. And HP will license SecureWare's Hannah (its networking-security software) and Troy (its file-protection software). SecureWare will concentrate on complementary security technologies and services.

HP and SecureWare originally commercialized the technology in 1995 to protect the transactions of Security First Network Bank (SFNB; www.sfnb.com), the first federally approved and

insured Internet bank. Since then, HP, SecureWare and Five Paces Software Inc. (Atlanta, Ga.) have been offering the same solution to financial services institutions. SecureWare has developed the Global Decision Support System for the U.S. Air Force Mobility Command.

In yet another related Internet announcement, HP announced that it intends to make an equity investment in Business@Web (Cambridge, Mass.), an Internet business-application development company. In addition, the two companies have agreed to do joint marketing and Internet consulting.

Consequently, HP's PSO and Business@Web will begin to offer solutions using Business@Web's OpenScope development software, which extends legacy and client-server applications across intranets and the Internet. Business@Web is spin-off from the Cambridge Technology Group, a systems integrator located in Cambridge, Mass. ●

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HP APPLIES THE SUN SCREEN

Everyone's aware that too much sun isn't good for you. Although HP can't help you at the beach this summer, the company still wants to help you with a Sun screen of a different kind. In mid-March, HP announced an extra incentive to their Sun Open Migration Program. HP is now offering Sun Microsystems (Mountain View, Calif.) customers an extra \$2,245 value by providing free HP-UX 10.10 System Administrator Training (a Sun Interoperability Guide and Sun Porting Manual also are included). That's in addition to the up to 20 percent discount applied when a Sun server is traded-in on a purchase of an HP 9000 server.

Since the Sun Open Migration program began in April 1995, 35 companies, including Lockheed Martin, Hughes Space and Communications, Ohio State University and Philips NV Medical Systems have migrated from a Sun to an HP platform. According to a

recent report from the Aberdeen Group (Boston, Mass.), HP now has a 49 percent share of the UNIX/RISC-based server market (an increase of four points from last year). HP is attempting to take advantage of what is perceived to be a weak spot for Sun's commercial customers who must either upgrade their Sun SPARC-based systems to its 64-bit UltraSPARC platform or go through a particularly tricky OS migration from SunOS to Solaris 2.5. ●

WALKING THE WALK AND TALKING THE SMALLTALK

ParcPlace-Digitalk and HP inked a joint development and licensing agreement for Distributed Smalltalk. Under the terms of the agreement, HP grants ParcPlace-Digitalk the exclusive rights to enhance, market, distribute and support Distributed Smalltalk as well as use the technology in the development of future products. ParcPlace-Digitalk will port Distributed Smalltalk to its core

products VisualWorks 2.5 and Visual Smalltalk Enterprise 3.1 later this year.

Distributed Smalltalk 5.0, based on the Object Management Group's Common Object Request Broker (CORBA) 2.0 specification and originally developed at HP, can enable programmers to develop and deliver multi-tiered object-oriented distributed applications. CORBA 2.0 includes the Internet Inter-ORB Protocol (IIOP), which is designed to enable objects and applications to interoperate over a network with other CORBA 2.0-compliant ORBs. Distributed Smalltalk, as developed by HP, is built on ParcPlace-Digitalk's Visual Works application development environment.

Priced at \$4,995 for UNIX platforms (HP-UX, IBM AIX, SunOS and Solaris) and \$2,995 for PC platforms (Windows 3.1, Windows NT and OS/2), Distributed Smalltalk is expected to be available through existing ParcPlace-Digitalk distribution channels worldwide. ●

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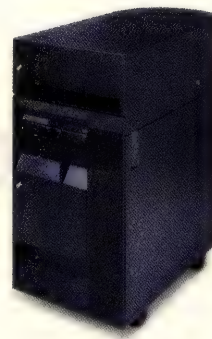
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Ultrasound Images In A Heartbeat

Although HSM is a good overall solution, it may not always be the answer in some applications. For example, Duke University Medical Center is now effectively using a *direct access system* to manage an unprecedented number of digital ultrasound images in its echocardiography laboratory. Unlike HSM archival systems, direct access storage enables you to create files directly on secondary storage (optical disk or magnetic tape) using the standard magnetic disk access methods of the host operating system.

Heartlab Inc. (Providence, R.I.), a developer of high performance medical image systems is responsible with its partner Lockheed-Martin for system integration within the hospital's busy diagnostic laboratory. Heartlab has integrated their EchoNet digital ultrasound management system with AMASS direct access software from EMASS Inc. (Englewood, Colo.) along with HP equipment (see configuration box, p.18). The system takes digital data directly from an ultrasound cart and stores it on a central server in a compressed format. At review stations located throughout the hospital, doctors can search for a specific set of tests stored online on the central server. Or, they can access older images which are being tracked by the direct access software but are being stored offline in an archive.

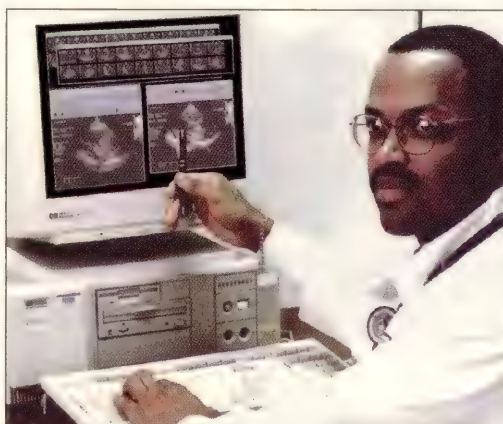
Echocardiographers, a highly skilled group of physicians, have the difficult job of interpreting these cardiac ultrasound image studies. And on a typical day, they will conduct as well as read

about 50 ultrasound studies. Physicians need to be able to control where specific data is located in order to get at it within seconds. To make this possible, Heartlab chose to implement AMASS direct access software with the laboratory's central server and optical disk devices. Designed as a distributed architecture, there are separate demographic and image

videotape. Consequently, the Heartlab/EMASS solution has virtually replaced traditional methods of storing echocardiography images on conventional videotape.

In the past, these digital image studies were acquired from a primary imaging device and then stored directly on videotape. Unfortunately, doctors sometimes had to scan a large number

of tapes just to find a particular set of motion images. To complicate matters, if a patient required re-testing, the doctor often would need to refer back to the original study, to aid in diagnosis. This meant once again having to locate a specific section on a tape. To escape this arduous, time-consuming task, some doctors eliminated



Heartlab has integrated their EchoNet digital ultrasound management system with AMASS to directly access digital ultrasounds.

the videotape scanning process entirely, instead referring only to the original report.

Another reason why Heartlab chose a direct access software solution over HSM was because of the software's efficiency in distributing large files. "The typical image file size that we're dealing with in the echocardiography lab is about 2 MB," says Bob Petrocelli, president of Heartlab. "It's very important that we're able to burst that very rapidly over the medical center's network. With AMASS, even at the optical jukebox level, we're able to get very good performance because we're able to tune the read-ahead buffering so

servers. This provides fast access to the image data and allows scalability of the system to potentially support multiple medical institutions.

The primary benefit with this direct access secondary storage system is that within 10 minutes of the completion of a full ultrasound study, full-fidelity test imagery is available to users on the network at either Duke Medical Center's North or South medical facilities. Historical data also can be instantaneously retrieved off the network to aid in patient diagnosis. The direct access secondary storage system has eliminated searching for digitized images on

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that it would be consistent with the average file size.

That eliminates the need to have to perform a staging operation to free up room for these older images on primary magnetic storage. Most data is less than 72 days old, so if we constantly had to retrieve it off the optical jukebox back to the server disk, the process could potentially kick off more valuable data or it could cause us to have to purge cache blocks, as might be the case with some HSM schemes."

Duke Medical Center Echocardiography Laboratory System Configuration

8 — HP 9000 (700) Series
central processor workstations
(review stations)

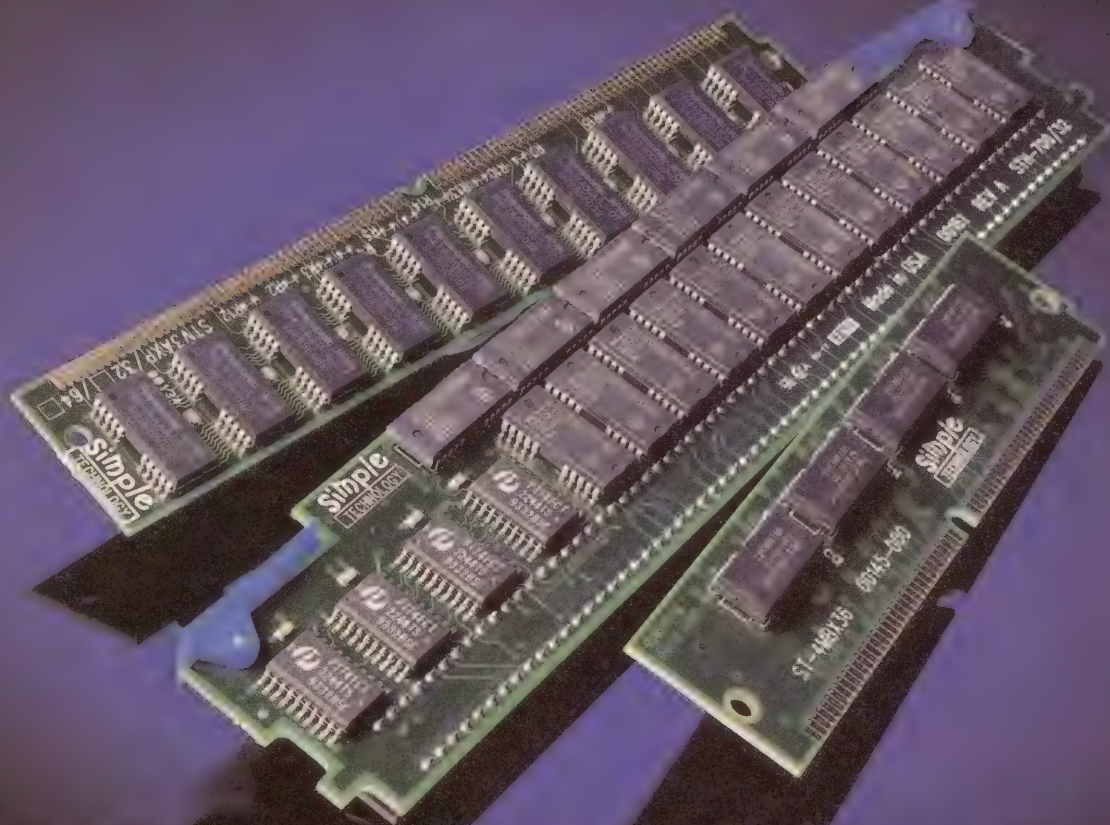
1 — HP 9000/725 used as a central
server sitting on a FDDI ring

Operating system — HP-UX 9.05

EMASS Inc.'s AMASS direct access
software

Heartlab Inc.'s EchoNet Digital
Ultrasound Management System Software

Heartlab's systems integration personnel have discovered another important benefit with direct access software — installation and integration have been easier and more seamless than with some HSM counterparts. "We're currently testing HSM solutions using our systems simulator," says Petrocelli. We've found that in some instances, HSM products aren't as robust as direct access software solutions. For instance, it took us two weeks to fully implement one of the new HSM products. AMASS only took a day to implement and integrate with the system. We've never had a down day with it." For Duke Medical Center's echocardiography laboratory, direct access secondary storage has improved medical care for patients. —Gerry Sutton, Contributing Author.



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HSM:

On A

pedestal of promise

A “pedestal of promise.” That’s where storage administrators were eager to place hierarchical storage management (HSM) after it was unveiled to the UNIX world several years ago. After all, HSM had been ballyhooed as the answer for anyone needing a more cost-effective approach to storing and accessing large amounts of data. HSM promised to free system administrators from the mundane chores of managing disk space and storage archives through sophisticated automated data management.

HSM promised other benefits too, like automated administration of storage to safeguard against loss, and shared access to data storage across heterogeneous environments where necessary. And, HSM also promised the ability to manage large data archives in a cost-to-performance fashion to help minimize the expense of keeping the data available. And to HSM’s credit, it has lived up to most of those promises. On the other hand, some of the promises have not been kept.

HSM systems attempt to provide automated administration so that files

are protected against loss, and so you can share storage resources wherever necessary. Large storage archives can be managed in a cost/performance trade-off which minimizes the cost of keeping all files available online. In addition, most HSM systems are designed to provide a view of the managed data to appear as though it is resident on magnetic disk. Best of all, HSM can help you become an instant hero because, at least in theory, it reduces your data storage costs by slowing down the proliferation of expensive client-server disk hardware while helping you better use

your existing data storage investments.

File migration is still the main focal point of the HSM. It works this way: You set up migration partitions and assign pre-defined migration policies. Users are given some level of control over the factors determining which files are migrated, such as access times or modification times or size. However, it’s the migration software that automatically performs the move.

HSM software usually stitches into the operating system kernel and traps calls to files in migration partitions. Then, files are migrated from the primary magnetic disk storage to secondary storage in order to maintain free space for new files on the magnetic disks. If the HSM software is clever, it will retain just a portion of the file called a stub file or “fence post” and a pointer on the magnetic disk. These are used so “reloads” or accesses that don’t require more than just the first few hundred bytes can be satisfied without having to retrieve the entire migrated file.

First, HSM can still be a bit tricky to implement. That’s because it’s not easy to fool a system into thinking its data is elsewhere and still allow you to retrieve

Pete Koliopoulos and Gerry Sutton

that data reliably. In addition, HSM performs its function by being aware of which files have been used recently and which have not. For this reason, you don't ever want anything on your system to destroy this information, or HSM will not operate correctly.

THE BASICS OF BACKUP

WITH HSM, FILES are migrated off the disk based upon some user-defined migration policy. Ordinary backup utilities travel up and down a filesystem and copy files to secondary storage. You could have a disaster on your hands if a "full" backup caused every migrated file to be pulled back in off of optical disk or tape, or worse yet, if the migrated file were located offline on a shelf somewhere. To solve this problem, many HSM vendors now provide a means by which migration/reload can be side-stepped. This can be solved with a special switch that only allows the backup routine to copy the stub file to tape or optical. This also can be accomplished with a special group whose processes see stub files for what they are, rather than the data "mirages" the rest of the system sees. This can also be accomplished by a wrapper routine that scans or "swathes" programs and prevents migrated files from being reloaded.

Some HSM software vendors address the issues of backup and lost

data by providing special local and client-server backup packages that can work with their HSM solutions. Still others solve this problem by making their HSM software compatible with a broad range of third-party backup packages. This is usually done by providing a framework which runs the third-party package so it doesn't destroy the vital information needed by the HSM system. Rather than locking you into just one backup solution, some of these vendors are now "open" enough so you can exploit the range of backup packages — thus giving you alternative strategies and greater flexibility.

MORE STORAGE THAN MEETS THE DISK

HSM SYSTEMS tend to impose additional storage overhead on files.

Although some vendors have reduced the amount of storage needed to run HSM, be prepared to face the fact that an HSM system that puts files on secondary storage may require additional storage for the following:

- An inode to track the migrated file
- A data block for file information
- A local database entry for additional information
- A database entry on the secondary storage system to track file location
- An inode on the secondary system for identifying the data file
- The data file itself

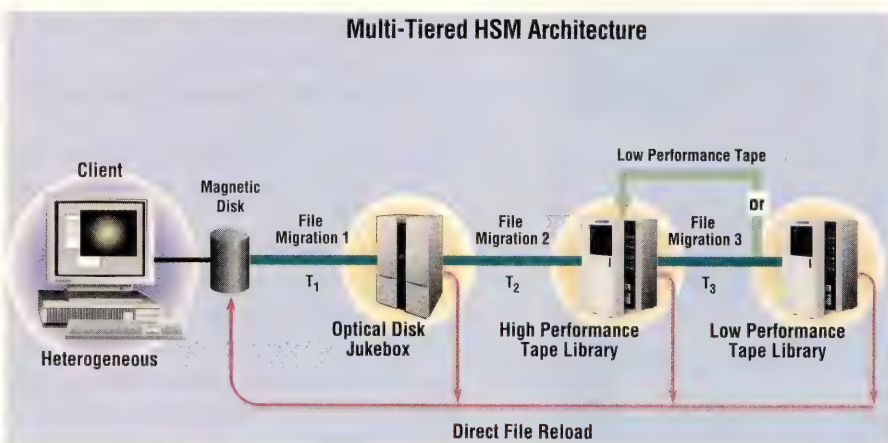


Figure 1: To exploit performance, your primary data migration might be from magnetic disk to optical disk. After a pre-determined period of time, direct access HSM software can migrate the data off optical disk and send it next to high performance tape. Later, as data ages, it is migrated from high-performance tape to high-capacity, low-performance tape.

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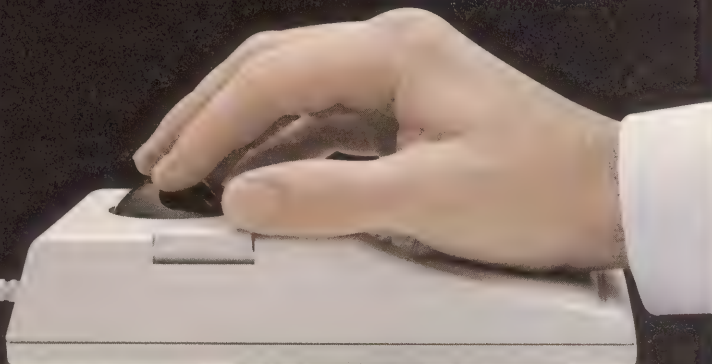
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CIRCLE 107 ON READER CARD

HSM

When considering an HSM solution, it's important to determine how much storage is used for migrated files and how much of your disk will be needed just to set up file migration. You also should determine whether there are functions on your system that could potentially defeat the data management

HSM Q&A

How do you rate HSM solutions? Simple. By getting a "yes" answer to the following questions:

- Will your HSM software coexist with and provide a seamless interface with other third-party backup software solutions?
- Can your HSM software be installed with little or no disruption to your main operating systems?
- Is file data available as it is migrated in, as opposed to waiting for the complete file to be resident on magnetic disk?
- Is it possible to determine if a file is resident or non-resident?
- Is it possible to manually migrate data in and out?
- Does the system support high and low watermarks for controlling available disk space?
- Will the system support pre-migrated files so their space can be freed up quickly?
- Will the system catch an "out of space" prompt or begin a "demand migration" prompt to create space instead of returning an error?
- Can you migrate files in both directions? (Some HSM solutions only migrate out and only provide direct access to those files after being migrated.)
- Can your HSM software manage pre-existing file systems?
- Does your HSM solution offer true, full-featured multi-tiered migration capabilities?
- Does your HSM solution offer file replication to multiple storage devices and/or media types for disaster recovery?
- Does your HSM software couple with direct access software on the back end so that all data appears to the user as online?
- Will your HSM solution enable sharing of storage resources in a heterogeneous environment? —G.S.

system. For example, when reading files, is there anything that could periodically sift through your system and cause all files to migrate back?

HSM: THE NEXT GENERATION

THANKS TO A new generation of HSM solutions from EMASS, IBM, Qstar and others the future of HSM is a bright one. Some are providing the features and functionality to deliver on the promise of *cost-effective, limitless data storage*. In the past, you may have had to dedicate a full-time staffperson (or persons) just to administer, manage and

With earlier HSM functionality, backup was time-consuming, tedious or even non-existent. Fortunately, some of today's new HSM software packages include file replication (see Figure 2).

Some HSM solutions now reside atop direct access software to provide true direct access to your secondary storage resources (see INsites, page 14). Most of the well-known operating systems can now share the data migration/recall and network storage loads for greater overall system efficiencies. This direct access/shared storage approach creates a more scalable system and one where additional capacity can be added in smaller, more cost-effective

increments.

In principle, HSM is a brilliant technique. HSM can help you coax gigabyte or even terabyte data capacities from magnetic disks with mere megabyte capacities. Rather than having to spend a bundle of cash on additional expensive magnetic disk storage to keep up with demand, you spend fewer dollars per gigabyte

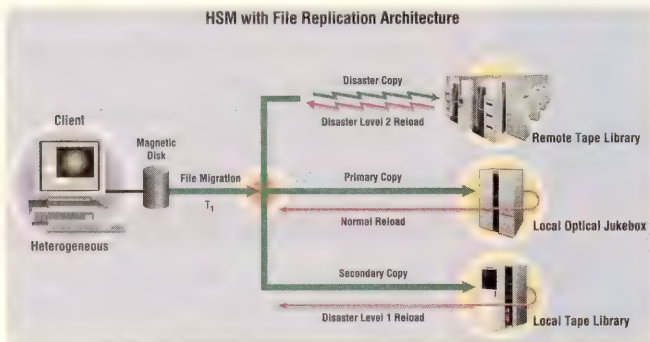


Figure 2: File replication allows you to replicate files and send them to multiple geographic locations across both LANs and WANs. In the case of a primary file failure, the replicated copies can be transparently retrieved. This new level of architectural robustness has helped elevate UNIX-based HSM as a viable recovery solution.

maintain an HSM system. If so, the new generation of HSM solutions has, in varying degrees, simplified the processes of implementation and operation.

Some packages now provide full file, volume, drive, jukebox and tape library management, as well as the tools needed to control, configure, and monitor optical jukeboxes and tape libraries. And a number of user-friendly GUI interfaces provide easy system setup, configuration file editing, automatic and manual migration, and GUI-assisted retrievals. With some of today's HSM solutions, system administrators can simply install, configure and then walk away to take on more pressing data management issues.

Today's HSM solutions have evolved to a new level of data storage management sophistication too. Now there is full-featured, multi-tiered file migration for clients as well as servers (see Figure 1).

on secondary storage like an optical jukebox or magnetic tape library. Your least-used files are sent off to this lower-cost storage so that file space can grow, files can get bigger and there can be more of them on your primary storage. And on the horizon, a new generation of HSM solutions offer new ways to keep its original promises from being broken. Dust off the pedestal. —Pete Koliopoulos is director of new business development at EMASS Inc. (Englewood, Colo.). Gerry Sutton is senior marketing communications specialist with EMASS.

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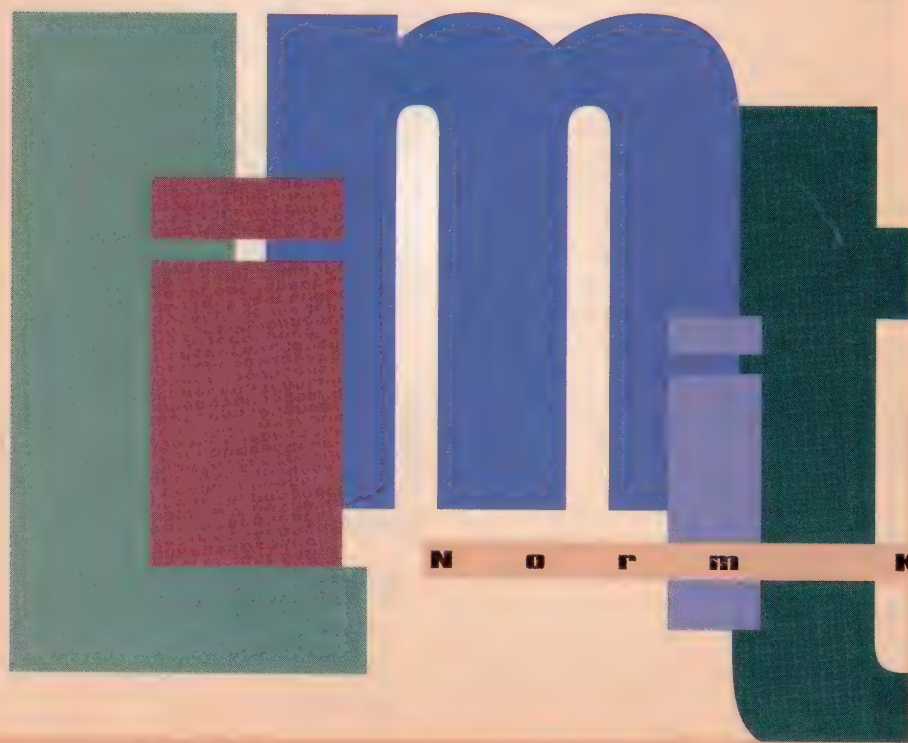
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Tape It

T O T h e



It quickly became apparent that the idea was too good to waste on poor disk systems. If RAID could make several poorer disks look like one super disk, what could it do if you used it on several super disks? So the application, and the words in the acronym now became “Redundant Array of Independent Disks.”

In the 1990s, several vendors began to apply the technology to tape systems. Just as with disks, several tapes could be used together to emulate a single drive which would be much faster, and have a much greater capacity, than any one drive alone. Another

word had to be changed to make it “Redundant Array of Independent Devices,” but no matter.

Those first generation tape RAID systems entered the market without

making too great a splash. That was largely because they didn’t outperform single tape devices by as great a margin as was experienced with disks. But that’s changing. New tape RAID architectures and new silicon are launching a second generation of tape RAID. These new systems are capable of performing reliable backup of very large files at very high speed, capturing data at very high rates or spinning off multiple backup copies in the time usually required to do just one. The larger your files and the faster or more frequently you need to save them, the

RAID was one of those concepts that was too good to leave alone. Invented in the 1980s as a means to allow several lower-performance disks to take the place of one high-performance model, its acronym originally stood for “Redundant Array of Inexpensive Disks.”

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IF IT'S NOT A DISK, CAN IT STILL BE RAID?

DISK RAID systems gain an advantage over single disks by writing or reading from several drives simultaneously or almost simultaneously. The overlapping or interleaving takes one of two forms: striping or mirroring.

In the highest throughput form of disk striping, byte one of data goes to track one/drive one, byte two to track one/drive two, byte three to track one/drive three. Three or more drives are written in rapid succession, and the result is the same as if there were only one drive which happened to be three or more times as fast.

The same can be accomplished with tape RAID. Three or four or more tapes can be written almost simultaneously, just as if there were only one, very fast tape drive.

Mirroring is like a special case of striping. The difference is that the same data is written to all of the drives simultaneously. In disk systems, usually only two copies are made, and both remain online — one as backup for the other. With tape, two or more copies can be made. One might go to a local vault, while the other goes to an offsite disaster recovery center. It would be unusual for either of them to stay online. Both mirroring and striping work well with tape media. It may not be disk, but it's still RAID.

WHO NEEDS IT?

WHO NEEDS tape RAID? Banks and financial institutions, brokerages, medical facilities, insurance firms, title insurance firms, government agencies, shippers, airlines and reservation systems. More and more users seem to have larger and larger files. The club of users with a terabyte (a trillion bytes) of data on file is still somewhat exclusive, but growing fast.

All that data has to be backed up. Some of it has to be backed up every

night. And in worst case scenarios — banks, for instance — users may need more than one copy. The storage medium must be not only fast enough to take all the data overnight, but also must provide fault tolerance.

Mirroring allows a user to make two copies of their backup in the same amount of time it would take to make one copy; that is, in half the time it would take to make two copies. One West Coast-based financial institution uses paired mirroring to make the time even shorter. It feeds two job streams (backup for two different files) to an array of four tape drives, and makes two copies of two files simultaneously. Modern tape RAID hardware allows for running all four tapes at full speed, in this case, Quantum DLT4000s which have a recording speed of 1.5 MBps each, uncompressed (3.0 MBps with data compression.)

And backup's not the only reason for speed. Geologists, engineers and NASA scientists sometimes get only one try to record as much data as quickly as they can. Faster is better for them, too.

One oil exploration company uses a ship-based tape RAID system for high-speed recording of seismic and other data. In their case, they produce two data copies simultaneously and automatically switch to two other drives in the array when the first two cartridges are full. The drives are IBM 3480-type, which record at an impressive 3 MBps each (uncompressed), but fill up fast.

Then there's the major entertainment company that makes CD-ROMs for games. They have to back up over 800 GB of data spread over several servers. To do it, they use striping over five drives (four plus parity) for maximum speed, and include automatic tape stackers to make it all automatic.

WHY TAPE RAID IS HOT NOW

In 1995, some new tape RAID systems began to hit the market. They were a great improvement over what had come before. The greatest changes seen were in controller electronics

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where Digital Signal Processors (DSP) and purpose-specific chips replaced more mundane general-purpose processors, and in array architecture.

First generation tape array systems were built around a shared bus architecture, and that bus was usually a 10 MBps SCSI. While it was possible to overlap multiple read or write operations, the degree of parallelism was not impressive. Designing for larger data transfers led to idle tapes waiting for data, and designing for shorter transfers led to unacceptable bus contention.

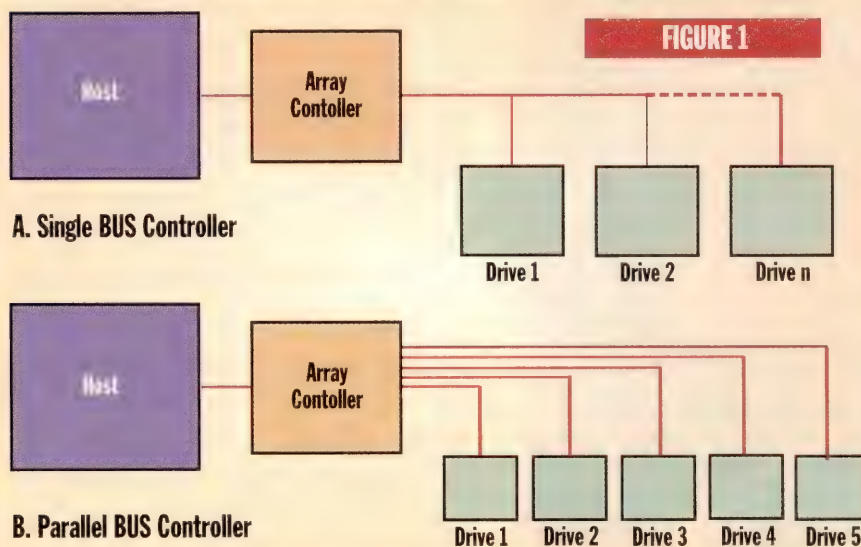
Newer designs feature independent

tape array can operate at an effective speed that is 400 percent that of a single drive. The host system may not be fast enough to keep the tapes running full-speed, and the backup software can cause delay, as can the data itself, but if 400 percent is difficult to achieve, 300 percent is a realizable number.

WHAT DOES IT TAKE?

TAPE RAID IS a hardware and software solution. You need a RAID tape array, plus backup software, and a host

FIGURE 1



First-generation tape RAID arrays used shared-bus architectures that led to mediocre performance, especially in striping operations. Newer controllers have an independent bus for each drive, a higher speed link to the host and electronics that are fast enough to allow for byte striping.

buses between the controller and each drive, which eliminates much bus contention (see Figure 1). "Fast and wide" 20 MBps buses are used between the controller and host, giving the drives somewhat more room to breathe. And the degree of parallelism, the amount of the time that multiple drives are operating simultaneously, has been greatly improved by reducing the data interleave size to as small as a byte — which now can be done thanks to the faster DSP-based electronics.

As a result, today's newest tape RAID systems can deliver several times the performance of a single drive. For example, a well designed

that's fast enough to drive the array at a meaningful speed. You do not need a special version of the backup software or special peripheral drivers.

One of the big advantages of basing a tape RAID system on a SCSI interface is that it can all be made transparent to the host. As far as the host is concerned, the array looks and operates like a single drive. If the host is an HP 9000, and the HP 9000 has what it takes to write a single Quantum DLT4000 tape drive, the array controller can make a set of three, four or five DLT4000s look like one.

Are there some fussy little fixes that might have to be made? Often not.

To protect your data, you could back-up hourly, buy a fire-proof safe, and a \$5 million insurance policy.



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RAID



Tapes are already capable of 20 GB capacities (uncompressed) and transfer rates in the range of 10 MBps; they'll soon go to 50 GB and 15 MBps.

Does your Novell image-backup software demand to be assured that your DLT4000 has adequate capacity before it will transmit a 100 GB file? You'll need to tell it that your "tape" has plenty of space, and that's a one-time fix.

Tape array hardware is available from Andataco (San Diego, Calif.), CoComp (Fort Collins, Colo.), LAND-5 (San Diego, Calif.), Symbios Logic (Fort Collins, Colo.), Trimm

U.K. (Nottingham, United Kingdom) and Virtual Technology (Rochester Hills, Mich.), among others. Their choices of drives will differ depending on which drive manufacturers each represents. Fortunately, however, the number of vendors is large enough that users should be able to find one which offers their favorite medium (4mm, 8mm, 3480/3490 or DLT) and brand.

Well-known backup software is available from Arcada (Lake Mary, Fla.),

Cheyenne (Roslyn Heights, N.Y.), Legato (Palo Alto, Calif.), Palindrome (Naperville, Ill.) and others. And skeptics, who think the software won't be able to keep up with the tapes, should check out AT&T's blindingly fast new NetVault; it only works on UNIX systems for now, but give them a chance.

IS THAT ALL?

MORE IS ALWAYS on the way. As far as the controllers are concerned, 40 MBps Ultra SCSI is just over the horizon. Tapes are already capable of 20 GB capacities (uncompressed) and transfer rates in the range of 10 MBps; they'll soon go to 50 GB and 15 MBps. Need even more? Watch for today's tape RAID arrays to be used in tape libraries (they already know the stacker commands).

And will you still need tape RAID when faster drives come out? You will if you want fault tolerance or to go faster than one drive can go or to make more than one copy at a time — which were the reasons for RAID in the first place, remember? — Norm Kiefer is the product manager for Ultera Systems (Laguna Hills, Calif.) a manufacturer of tape and CD-R components.

Would you like to continue to see articles on this topic?

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How BIG is a terabyte?

Enough to store 250 byte profiles like this one below on 4 billion people, roughly the entire population of the earth. And you have to finish your backup by when?

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Torrance, California

Client-server is a competitive weapon that can allow companies to improve customer satisfaction, reduce time-to-market and increase productivity, if implemented and used correctly. However, from the beginning of the transition project, it is vital to focus on the expected business benefits and understand the business goals of the planned transition to client-server.

Guy Wood, managing director of IT for United Grain Growers (UGG; Winnipeg, Manitoba) contracted with HP's Professional Services Organization (PSO) to help him lead his 60-strong IT team through a transition from an IBM mainframe to a new client-server-supporting HP platform. "We recognized that transitioning to a new client-server environment would dramatically reduce our IT costs in the future. In fact, the transition is now saving UGG \$1 billion per year," he maintains.

While cost savings were an important benefit of the transition, other

business objectives were identified. "We wanted our new system to deliver improved functionality during a time of corporate change. UGG was going public, and our industry was deregulating; this meant that the UGG staff needed access to information quickly and easily. Our old mainframe was inadequate, because the process of getting information stored electronically was unfriendly and tedious. This had to change," says Wood.

A Smooth Transition

EVALUATING ALTERNATIVES

ONCE THE business needs driving the transition have been identified and analyzed against the current environment, the various IT alterna-

tives need to be evaluated and compared. Some of the questions which should be asked are:

- What IT investments can be preserved in the new client-server environment?
- What criteria determine which application should be migrated?
- Can the transition be accomplished in a timely and cost-effective manner?
- Do we have the internal expertise required to be successful?

"Transition recommendations may include re-hosting, replacing, re-architecting, surrounding or even outsourcing the existing IT environment," says Jeff Louie of HP's PSO. "The issues, benefits and risks associated with each option need to be objectively quantified."

The surround strategy combines a number of techniques that enhance the "value" of existing legacy functions and data. New applications may be developed and integrated with legacy systems and data residing on the mainframe. An example would be a new customer service application with a GUI and local processing on a client workstation integrated with existing legacy data.

Re-architecting also is popular, perhaps as a result of business process

re-engineering projects and the subsequent need to match technology solutions to new and revised business functions. One technique involves re-engineering existing application functions that do not effectively support the business to a distributed client-server environment using new technologies such as objects.

A re-hosting strategy is usually undertaken to achieve tactical objectives such as cost maintenance, mainframe upgrade avoidance and corporate restructuring. Re-hosting provides the same application on multiple platforms while maintaining exact functionality. It requires less end-user training and protects existing investments in software and people.

The re-host option was the one chosen by UGG. "We wanted to move to a new platform that supported client-server, batch and online processing as we saw benefits in each," says Wood. "Re-hosting was our best option, and we focused on completing that project as quickly as possible and avoided becoming side-tracked by other projects. Our strategy was to move on after that project to work on new ideas aimed at exploiting the new environment."

EDUCATION

THE TRANSITION to the new solution architecture will require a new set of technical and personal skills to support the implementation. Within the organization, the current level of skill needs to be profiled, the skills gap identified and training programs initiated. By attending to personal skills, such as communication, analytical and team-building skills, the company will help facilitate successful working relationships within and between IT and business units. This is critical for a successful transition to the new organization and environment.

"Our experience has shown that the greatest challenges in a transition are related to people rather than technology," said Morris Wallack, education manager at HP's PSO. "The goal is to reduce resistance to change, increase support for the new solution

and remove employee doubts about the technology and their role in the new environment. With the right management sponsorship and education, the entire organization will support the transition with enthusiasm, motivation and effective actions."

Wood recognized that he and his staff needed help making the transition to the HP platform and UNIX operating system. "Our IT staff has been working in a mainframe environment, and some initially resisted the change. We worked with HP's Professional Services Organization and application vendors to retrain our staff in a sensitive and structured way. We had good IT people and we wanted to bring them with us into the new environment by giving them the training they needed."

THE RISK

BOTH THE BUSINESS and operational risks that could significantly impact the transition should be identified. A business risk can manifest itself in the form of strategic, political or environmental issues associated with any IT project. Business risks also can be associated with economic and competitive factors that may have a negative impact on the outcome of the project. Operational risks can be defined as those risks that have a relatively known level of uncertainty, are quantifiable and are basically internal to the project (i.e., cost, schedule, personnel, equipment and technology).

Technical risks may include an inadequate definition of requirements, a reliance on immature technology, poor estimates or insufficient skills.

The cost analysis considers all component costs required to implement the entire transition strategy and documents any assumptions for those components that cannot be quantified at the time of the analysis.

Some of the major cost components of transitioning to open systems are:

- Systems and networking
- Support
- Education and Training
- Project implementation costs
- Development system costs

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Before full implementation and deployment begin, some companies implement a pilot project at a single site or from a specific workgroup. This can be helpful in designing, programming and testing communications and prototype applications, as well as in creating operational guidelines.

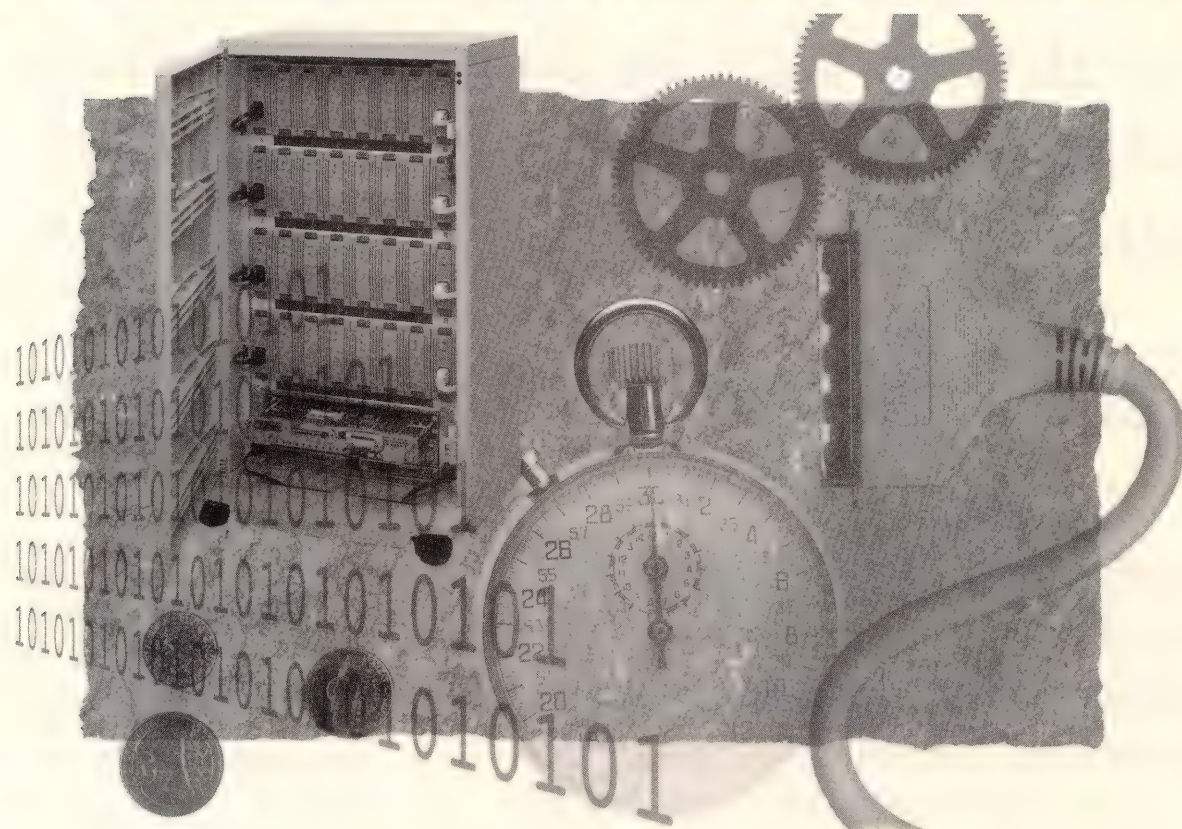
OUTSOURCING

RATHER THAN manage the transition and new computing environment internally, some organizations prefer to outsource the challenge to a third party. Outsourcing allows organizations to remain focused on their core business challenges without becoming side-tracked by a large-scale transition project and system management issues.

Some companies may be uncomfortable relinquishing entire control of technology when it is recognized as such a key business enabler. "A popular approach is to selectively outsource only certain operations. This philosophy of combining internal and external resources helps customers focus on their core competencies while employing outside technical expertise to manage other functions," said Joel Gerston of HP's Worldwide Customer Support Operations.

In the final planning step, review the transition approaches and create a high-level timeline to identify the major milestones and relative time frames for various aspects of the overall transition project. Relationships and dependencies that are critical to the overall success of the transition project should be considered. Organize and depict parallel activities where appropriate, attaching relative priorities based on overall requirements, application strategy, and product and solution availability. Working with internal staff, external consultants and third parties, develop an estimate of the time required for each component of the transition plan. — *A special report compiled from HP's PSO.*

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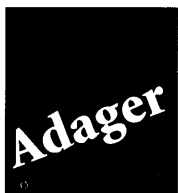
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PCs may be proliferating on the desktop, but many organizations cannot afford a wholesale replacement of their host-based computer configurations. For many years, terminal emulation has provided a link between the desktop and corporate information.

Most terminal emulation vendors now refer to their products as host-connectivity software. And indeed, today's emulation software goes beyond the terminal to integrate data from multiple systems and database platforms with Windows-based desktop applications.

PC-to-host communications in the HP market is a "one vendor market. And that one vendor is WRQ," says Elisabeth Rainge, PC connectivity analyst at International Data Corp. (IDC; Framingham, Mass.). Rainge contends that HP terminal emulation has become a commodity market, because you can almost use any UNIX emulator for connectivity to HP 9000 hosts.

While some industry analysts share Rainge's opinion, connectivity vendors such as WRQ (Seattle, Wash.) and Attachmate Corp. (Bellevue, Wash.) see a different picture. WRQ and Attachmate point to a loyal installed base of HP 3000 system managers who need host communications software to run their applications for machines such as the old superset terminal HP 700/98 to HP hosts. "The HP market for terminal emulation is anything but dead," explains Paulo S. Chow, product engineer and director of Attachmate's Product Management Open Systems Product Group. "While it is true that the HP 9000 server is a UNIX box — so any number of generic terminals, including VT, can access it — many HP

3000 systems who have moved their applications to the 9000 Series still continue to use their old terminal interface."

According to Linda Merrick, WRQ's HP product manager, "The 3000 community is an incredibly loyal bunch. They'll be around for a while. And, HP has a strong VAR channel that develops apps for the 3000."

EMULATION AS YOU KNOW IT

IN THE PAST few years, many terminal emulation vendors have significantly enhanced their products, fueled by an increasing number of computer sites hoping to integrate workgroup computing, videoconferencing, imaging and other capabilities into their business environment.

Emulation vendors will continue to focus on emulation quality and provide features to increase usability. Many vendors have introduced OLE compliance and product suites — connectivity software that integrates

End Of The Line For Terminal Emulation?

D o n n a G a s l e w s k i

With the advent of the client-server paradigm, you might expect to find terminal emulation on the endangered technology list. But emulation remains a straightforward solution that allows IS managers to retain their investment in centralized information systems.

CONNECTIVITY COMPARED

Host-connectivity products are built on the foundation of terminal emulation, and the industry's leading vendors provide about the same basic functionality. The differentiation is in the details. What value-added features does each offer? Is the software modular so I can purchase only what I need? What comes bundled and what do I have to pay extra for? The following is a comparison of eight HP-based host connectivity products, based on information provided by the vendors. Note that while most vendors offer a range of software, we focus on only the flagship product.

KEA! 420 for VAX/UNIX
KEA! 340 for VAX/UNIX
Base price: \$245 and \$395, respectively

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The KEA! family from Attachmate Corp. (Bellevue, Wash.) includes KEA! 420 for VAX/UNIX and KEA! 340 for VAX/UNIX, which respectively provide VT420/340 and VT340 emulation for Windows, Windows NT and Windows 95 to VAX and UNIX systems, including HP-UX and Digital UNIX. KEA! for VAX/UNIX includes the proprietary Attachmate Enterprise Access Library API set for integrating host information into front ends built with Visual Basic and PowerBuilder, among other development environments. Attachmate's Tools! for Visual Basic and Tools! for PowerBuilder cost \$195 each. Visual Basic calls can be generated to KEA! with Attachmate's QuickApp development tool, which helps you build front-end applications without writing code — an alternative navigation tool from OLE Automation. KEA! features custom menus, dialog boxes, button pads, a macro language, toolbars, keyboard mapping and help.

Connectivity includes integrated ftp; NetWare for DEC Access, with non-TSR-based multiplexing of sessions; and NetWare Connect support through Novell's NASI.DLL. KEA! for VAX/UNIX supports TCP/IP, LAT and IPX through Attachmate's Link TCP/IP kernel, which comes bundled with KEA! products, and through support for NetWare for DEC Access and Firefox NOV*ix. Licensed technical support for KEA! costs up to \$1,200.

PowerVT for Windows
Base price: \$69

Dart Communications Inc.
(315) 655-1024
<http://www.dart.com>

Circle 346 on reader card

PowerVT Advanced VT Emulation Package for Windows from Dart Communications Inc. (Cazenovia, N.Y.) provides VT52/100/220 emulation to HP 3000, HP 9000, VAX and IBM systems, as well as HP-UX, Digital UNIX and RS/6000. The MDI interface provides multiple concurrent session on the desktop, using Telnet, modem and direct connections over network and COM ports.

With PowerVT, users can customize configuration settings for each session, with options for color, fonts, row size, scroll-back buffer size, key remapping and programmable keys. PowerVT supports autoprint, printer controller, print page and cut-and-past features.

The single-purpose product runs on any WinSock-compliant system and is built on Dart's PowerTCP line of protocol libraries. With PowerTCP Protocol Libraries for Windows — which supports Microsoft C++, DLLs, Visual Basic and native Delphi versions — developers can write custom networking applications without writing socket library code. TCP, Telnet, ftp, RSH, RLOGIN, REXEC, SMTP, UDP and SNMP protocols are supported.

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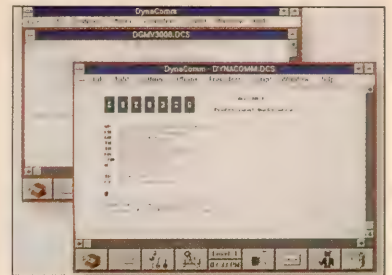
Circle 345 on reader card

The DynaComm family from FutureSoft Engineering Inc. (Houston, Texas) includes DynaComm V3.2 for Windows. Version 3.2 supports HP 700/94 emulation as well as VT340 with ReGIS graphics and VT52/100/220 emulations. It supports HP 3000, HP 9000, Digital, IBM and Data General Dasher systems, among others. Version 3.2's scripting language contains more than 350 commands and functions and allows automated sessions with remote systems. It supports real numbers, floating-point math, parameter passing, 192 variables and indirect variable referencing.

With DynaComm Toolkit for Visual Basic, an optional package costing \$195, you can write custom Windows front ends using Visual Basic. A dialog editor lets you create front ends for host applications with graphical tools, as well as interpret and create the script code necessary to duplicate the design. Interface features include file transfer, automatic dialing from directories, keyboard remapping, a toolbar editor and drag-and-drop file handling.

DynaComm supports TCP/IP utilities such as PING and STP from such vendors as Novell, NetManage and FTP software. Users also have access to communications interfaces for modem or RS-232, ComBIOS, NASI/NCIS, Sun PC-NFS, WinSock V1.1, LAT and Pathworks.

Technical support is included with the cost of any DynaComm product.



DynaComm V3.2 for Windows supports HP 700/94, as well as VT340 with ReGIS graphics and VT52/100/220 emulation.

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Looking for a way to ease your enterprise into client/server technology without spending a lot of time and resources up front? We can answer your needs with FrontMan, our client/server development tool that gives Windows clients enterprise-wide database access from a variety of sources. Many sites have reported that FrontMan is proving successful in migrating legacy applications to client/server architecture.

Advacate leads the way

One of these beta sites is ACAT, a division of Advacate Inc. of Indianapolis. Advacate builds custom software and add-ons for HP sites that use ASK software. ACAT (Advanced Computer Analysis Technique) is the division that will be moving this ASK marketplace to a client/server environment. To make the migration possible, ACAT is combining Advacate's own VPlus-based add-ons with the tools of FrontMan.

"FrontMan allows ASK customers to integrate the functionality of ASK into a client/server environment," explains Daniel Levite, product manager for ACAT. "ASK custom-

ers are looking to go client/server. FrontMan provides a path to migrate over time, without a huge expense."

Levite sees FrontMan's ability to convert VPlus applications to a client/server environment as key. FrontMan does the conversion by splitting an application into a front-end section to handle the user interface and a back-end section containing the original VPlus code. A special library is linked to the application and intercepts interface-related VPlus calls, routing them to the front-end for further processing. The front-end automatically maps VPlus screen elements to appropriate graphical user interface elements.

Because FrontMan allows VPlus applications to easily convert to a Windows client interface, ACAT can convert their custom ASK software with relative ease.

First step — a facelift

As their first project, ACAT has been using FrontMan to convert a pilot application on the HP3000 into a client/server application. After a short time with FrontMan,

Levite found the interface easy to create, and got the screens coming up first. Work on the lower-level communication came next.

FrontMan provides access to IMAGE, Oracle, Sybase, Ingres, and many other database formats, and supports the ODBC standard. It also supports third-party indexing software, such as Omnidex, and Superdex. With FrontMan, you can incorporate data from completely different environments into a single, coherent interface. For ACAT's ASK customer base, FrontMan's flexibility means that users can integrate the Oracle data from their HP9000 with the ASK data on their HP3000.

"Advacate's been in the HP/ASK market since ASK first came out, 15 years ago" says Levite. "Turning our marketplace into client/server will be a real boon."

Without a transitional tool such as FrontMan, the outlay of resources for converting legacy applications to a client/server environment are tremendous, Levite observes. FrontMan alleviates this turmoil and cost.

FrontMan makes VPlus easy

Other sites have also reported significant success. Jeff Bales at Medford Oregon School District, for example, says they have already converted one of their major HP3000 applications, "without any

problem." Developer Dave Vorgang at Medford adds that FrontMan was easy to use in developing a client/server application to access the school district's IMAGE database.

"I was surprised at how good the screens looked," says Vorgang, after converting the first View file, "They did need some tweaking, he says, "But they were easy to customize."

FrontMan uses a Microsoft Access compatible database as its native data structure, but can access virtually any database via ODBC. It runs as a Windows application on the PC, where you have access to a variety of tools for building a Windows-based database application. This application can be used as a front-end to access enterprise-wide data.

Command performance

FrontMan includes a command language of 180-plus commands, as well as encapsulated commands that provide a huge savings in development time. The interactive development environment allows you to execute single commands in any order and check the results as you develop. You can create libraries of commonly used scripts and embed replaceable parameters that will automatically change according to the operating environment. FrontMan's script editor also allows you to execute commands as you enter them, including ISQL-compatible commands.

FrontMan also features a Visual Basic code generator that actually writes the source code for the user, shortening development time.

FrontMan allows you to manage your databases. You can create, modify, rename or delete databases, tables, and items. You can use FrontMan to query all of your corporate databases. Using FrontMan, you can add, change, search, and delete data while you are developing and testing the user interface.

Link a wide range of data

With FrontMan, you can create not only front-end screens for editing and entering data, you can also create reports, new databases, and new database tables. You can also:

- Change the structure of existing tables and the format of existing table items.
- Add or remove indexes to tables.
- Create data dictionaries.
- Access multiple databases and tables, attach tables and move whole tables between databases.
- Set user's security levels.

An OCX/OLE Controls Toolbox in FrontMan includes controls for buttons, Image database access and VPlus. These controls link Powerbuilder, Visual Basic or Delphi applications directly to Image databases.

FrontMan gives HP3000 users a conversion path for their legacy database applications, without need for terminal emulation, and with no session using up resources on the HP3000. To use a FrontMan application for accessing HP3000 data, the host must have ThinLan Link, and the user must have a WinSock-compliant TCP/IP stack. That's all. FrontMan's integration to host data gives your users all the advantages of client/server computing: seamless, simple and fast connections.

With FrontMan, you can take your users to a client/server environment now, without changing any VPlus source, without making changes to your database, and without altering your legacy applications.

Note: To find out more about ACAT's services, you can reach them at 317/577-8729.



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<http://www.minisoft.com>

Circle 339 on reader card

Minisoft 92 from MiniSoft Inc. (Snohomish, Wash.) provides full HP 700/92, HP ANSI and Digital VT320/220 CRT terminal emulation for Windows, Windows NT, Windows 95, Macintosh, DOS, OS/2, SCO and Sun platforms. It allows connections to HP, UNIX and Digital hosts across Ethernet, Token Ring or ARCnet LANs.

Minisoft 92 provides a command language similar to DOS; DDE and OLE Automation support; Windows screen handling with support for pull-down menus, menu bars and side bars; and keyboard remapping. Other features include inverse video, variable screen intensities, underlining, blinking characters and secure fields. Minisoft 92 can break to DOS without logging off. It also provides complete HP printer function support, including copy all, copy page, copy line, log top, log bottom and record mode. It has full editing capabilities: clear line, clear display, insert line, insert character, delete line and delete character. And, it supports line drawing and foreign character sets; multipage scrolling memory up to 60 pages, and a screen display capacity of 43 lines and 132 characters per line.

Bundled connectivity options include its own 32-bit WinSock-compliant TCP/IP stack, NS, LAT and Telnet virtual terminal protocols. Minisoft 92 provides proprietary file transfer, as well as support for ftp, PCNFS, LAN Workplace for DOS, Chameleon, NOV*ix, Frontier, Microsoft TCP/IP and Wollongong.

Online help and technical support is included.

Teemtalk-TCP/IP

Base price: \$99

Pericom Inc.

(609) 588-5300

sales@pericom-usa.com

Circle 344 on reader card

Teemtalk-TCP/IP from Pericom Inc. (Lawrenceville, N.J.) provides HP 2347/2622/2393 and 700/92 emulation, as well as Digital VT emulation, for Windows, DOS and X Windows environments connecting to HP 3000 and HP 9000 systems and Digital, IBM, ANSI, Data General, Prime, Tandem, Tektronix, Viewdata, Westward and Wyse hosts.

Teemtalk-TCP/IP features Windows DDL performance for non-TSR-based multiplexing of sessions, and supports packet driver, NDIS and ODI network drivers for interfacing with popular network cards through industry standard specifications. It is Ethernet-11 frame compatible; a multiple protocol stack configuration operates concurrently with other NDIS stacks including NetWare and LAT. A single Windows .INI file contains formatted network configuration parameters.

The software, available in nine language versions, features configurable Ethernet packet and maximum receive/transmit window sizes, bootp and name servers, local IP address and net mask values. It also includes PING client and network statistics monitor. ftp and terminal emulation is included for other clients.

Rumba for the HP

Base price: \$400

Wall Data

(206) 814-WALL

<http://www.walldata.com>

Circle 343 on reader card

The Rumba family from Wall Data (Kirkland, Wash.) includes Rumba for the HP, which provides HP 700/94, HP 700/92, HP 700/96, HP 700/98, HP 2394A and HP 2392 terminal emulation for connecting to HP 3000 and HP 9000 machines.

Interface features include: file transfer, a configuration toolbar and menus, a consistent user interface and online help. A mail integration feature allows users to integrate host applications and LAN based E-mail systems such as Microsoft Mail or Lotus cc:Mail. Rumba Tools products (sold separately) support APPC, Windows DDE, PowerBuilder, HLLAPI and Visual Basic to help users write custom front ends to UNIX hosts. Tools for Visual Basic costs \$200.

For TCP/IP communications, Rumba for the HP includes a 32-bit WinSock-compliant TCP/IP stack developed by TGV. TCP/IP capabilities also include a suite of TCP/IP applications and an optional feature called Rumba for the Internet, which costs \$100. The applications include Rumba File Manager, which uses ftp, LPD and LPR print utilities for routing TCP/IP print jobs; a dialer for remote access using the SLIP and PPP protocols; and other applications such as PING, uuencode, TIRPC, NFM and WinSNMP. Extensive font and color support also are included.

Rumba Office for NetWare Systems costs \$400. Rumba Office for Microsoft SNA Server costs \$150. Rumba Gateway System costs \$2,990. Technical support is available.

5PM Term for HP Systems

Base price: \$299

White Pine Software Inc.

(603) 886-9050

Circle 342 on reader card

The host-connectivity family from White Pine Software Inc. (Nashua, N.H.) includes 5PM Term for HP Systems, which provides HP 700/94, HP 700/92, HP 700/96, HP 700/98, HP 2394A and HP 2392 terminal emulation for connecting to HP 1000, HP 3000 and HP 9000 machines. Connections can be made via TCP/IP, direct serial connection and modem links. File transfers to and from the host can occur using ftp, IND\$File, ZMODEM, YMODEM, XMODEM or Kermit. Provides multiple, simultaneous sessions, printer support for VT terminals, choice of screen fronts, drag-and-drop keyboard mapping, online help, color mapping, movable status bar, WatchMe automatic macro script recorder, and hotkeys, hotspots and keyboard macros.

Compliant with Windows and Macintosh, 5PM Term ships with a TCP/IP stack, including the WinSock 1.1 API, and supports other WinSock 1.1 TCP/IP stacks. 5PM Term products can be enhanced with 5PM Pro — an optional terminal emulation front-end tool, GUI builder and distributed application development environment.

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information from multiple hosts using a common Windows interface. Moreover, look for vendors to follow Attachmate and WRQ's lead in host-connectivity support for Windows NT and Windows 95.

Emulation products, such as WRQ's Reflection, offer standard features you should expect from any emulation software. Precise emulation should be a given. HP 700/98 text emulation is a minimum requirement. Not all vendors offer this.

But vendors are moving beyond simple emulation. "It's hard to understand sometimes what host-connectivity vendors do," says Attachmate's Chow. "People ask us if we do terminal emulation. Yes we do, but terminal emulation is but one level, and we build on top of it. Of course, we don't look down on emulation, because that's the core of our entire communications strategy. If you don't get that part right, nothing else will work."

Vendors such as Attachmate and

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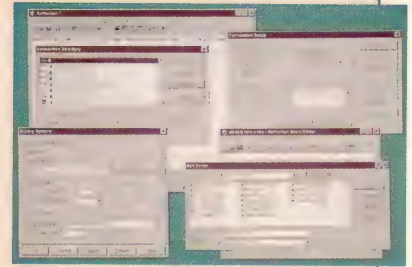
Circle 341 on reader card

WRQ Inc. (Seattle, Wash.) offers Reflection 1 for Windows 95 and Windows NT, which runs applications written for HP 700/98 and HP 700/96 terminals — as well as Digital VT220/102/52 emulation — for connectivity to HP 1000, HP 3000 and HP 9000 machines and UNIX hosts. Reflection 1 provides pull-down menus, a button palette, feature control, command finds and dialog boxes, and the ability to copy-and-paste between host and Windows applications.

You can run host sessions and Windows applications simultaneously and transfer data between them with the copy-and-paste functions and file transfer. DDE or OLE automation is incorporated into Reflection's BASIC-like scripting language, which features a script recorder, and is executed by the host, mapped keystroke, toolbar, DDE or OLE automation. With Reflection's dialog box, you can print text or graphics to your Windows printer.

Reflection supports CTERM, Telnet, WRQ's Reflection Network Series, any TCP/IP stack that supports WinSock, Novell networks, BAPI, Interrupt-14, V.25 server and IBM LAN Asynchronous Connection Server.

Reflection includes online help, and WRQ provides technical support at no charge for the life of the product, as well as one year of maintenance for new site-license customers. ■



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CIRCLE 241 ON READER CARD



WRQ have adopted a Microsoft Office look-and-feel, with toolbars that let you automate tasks to a push button. Leading emulation products also are defined by their programmability. In other words, the set of features and services that can integrate host data with Windows applications. For example, users want products that offer a scripting language to automate repetitive tasks, enhancing flow control and user interaction.

Vendors are providing other features to differentiate themselves from the competition. WRQ is distinguished for providing features that come at no extra charge to its customers — namely, Internet tools, a scripting language and its own TCP/IP stack. A lot of vendors say they support TCP/IP, but what they support is only a kernel implementation of TCP/IP, such as TGV's TCP/IP stack.

While a good single-purpose emulation product such as Teemtalk from

Pericom Inc. (Lawrenceville, N.J.) is ideally suited for many HP system managers' needs, there's also a growing demand for terminal emulation software that is part of a connectivity suite. Wall Data (Kirkland, Wash.) pioneered this concept in 1993 when it introduced Rumba Office, host software that integrates information from IBM mainframe, AS/400, VAX and UNIX hosts using a common Windows interface. While Wall Data does not yet have significant market share, it is making gains with Rumba Office. According to IDC's Ramage, Rumba Office had the largest market share in 1995 for a multihost suite that extends beyond the IBM arena.

Other emulation vendors also have released connectivity suites. WRQ's suite offering takes a different approach from Wall Data. Its Reflection Select-Suite allows you to build the combination of WRQ products you want. FutureSoft's recently released Dyna-

Comm Connectivity Series "emulates" WRQ's a la cart approach with 32-bit computing options, and also provides support for HP VT network connectors. White Pine Software Inc. (Nashua, N.H.), which recently acquired About Software Inc. (La Gaude, France), now offers a module product set providing connections from Windows, Windows 95, Power Macintosh and Macintosh desktops to HP hosts, VAX, IBM Mainframe and AS/400.

In a world where client-server is the media darling and on the minds of many a system manager, it's easy to overlook host-connectivity software. But terminal emulation remains a real solution for system managers who want to retain their investment in host-based platforms. —*Donna Gasiewski, Contributing Technical Editor. She can be reached at gasiewskdm@box101.cardinal.com.*

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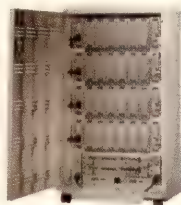
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Viva La Vim

When in Rome, do as the Romans. When in France, I guess you eat like the French. So as I

write this, I'm in a hotel room in Paris. And I've just ordered *Plat Chaud* (the hot plate; the other choice being the *Plat Froid*, or cold plate) from room service. I got a brown-green soup that smells like the age of fish that my dog would roll in, and a yellow sticky sauce poured all over what otherwise might have been a good apple pie. I hate French food.

As it turns out, it's not the restaurants I don't like, I just hate French food. Did I mention that already? Unappealing French food aside, what does this have to do with UNIX? For that matter, what does it have to do with vi (last month's topic), or vim, which is this month's topic. Well, you see, many people hate vi. But it's not really the editor itself that they hate, it just lacks some appealing features. I guess it's a matter of taste.

Last time, while reviewing the lesser known features of vi I promised a column on vim. So, what does vim stand for anyhow? Now, it stands for VI iMproved, but in earlier (less powerful) versions, it was VI iMitated. There have been many vi++ programs that have come along, the most

notable being the steVie program. vim is an improved vi program based on that project. However, although vim is non-standard, it's readily available in the public domain.

PLUGGING THE HOLES

vim was written by Bram Moolenaar from the Netherlands. Of course there was plenty of input from others, as is the way of public domain software. "Plugging the holes" in vi (only one undo, horizontal scrolling instead of line wrap) and modernizing its features (by adding macros, visual text ranges and rectangular text editing) were the goals in developing vim. Some people say it was to give vi the features of emacs.

vi's undo feature is abysmal. One undo, and even then, it only undoes edits to the current line. vim, on the other hand, allows you to set the number of undos — the default is 100. Use **:set undolines=number** to change that. Even better, there is an un-undo. If you hit **u** four times, and only meant to undo the last 3 edits, a **[CTRL]R** will redo the last undo (technically speaking, you use **[CTRL]R** to step forward through the undo stack).

If **keyboardedit!** is true, vi allows cursor movement while in insert mode, but vim *always* allows cursor movement while in insert mode. And there are some sequences for moving by more than just one character, such as **[SHIFT] cursor-key** to move by lines and words (**[SHIFT]up-cursor**

moves up one screen).

When you turn off wrap (**:set nowrap**), long lines do not wrap around the window; instead whatever will fit is displayed. If you move the cursor to the right, when you hit the right margin the text will horizontally scroll to the end of the line.

It's rather annoying to **[ESC]** to command mode just to issue one command, then return to the insert (or append) mode. So vim allows a one command escape using the **[CTRL]O** command. For example, as I'm writing this column, if I want to know what line I am on, I enter: **[CTRL]o [CTRL]g** (with vim) then I can just keep typing, and I'm back in insert mode, and the input point is in the same place.

The **wrapmargin** option of vi is somewhat useful, it forces line breaks at the right margin of the window, the problem is, how big is the window. But vim allows setting of a **textwidth**

option to force breaks at a number of columns (**:set textwidth=70**). There are also commands for center, left and right justification for lines of text.

Another sore point: when issuing an ex command from vi, only the backspace key works for editing. In vim, you can move with the cursor keys, insert, delete and even use the page up/down keys to recall previous (then next) commands. There are many more "fixes" to vi, such as making tab insert spaces instead of tabs (**:set expandtabs**), and being able to backspace over line breaks (**:set backspace=number**). But, due to the limited space of this column, let's look at some of the "new" features.

VISUALLY, A JOKE

There are WYSIWYG editors, control sequence editors and dual mode editors, vi is a dual mode editor. Calling vi a visual editor has always been considered a joke. You can't see vi commands as

they are typed, you can't see the line breaks and marks defining ranges of text are invisible.

But, vim has a visual range command: move the cursor to a starting point using any normal vi or vim movement commands, then press the **v** key (the visual range mark command), move the cursor again and the range of text you have marked is highlighted. Most commands will act on the range, as if it was developed with a movement command. The **v** command marks visual ranges of lines. vim also allows commands to act on rectangular blocks of text. Issue the **[CTRL]v** command, and as you move, a rectangle of text is marked. Normal commands issued (**d** for delete, **y** for copy) will act on the rectangle.

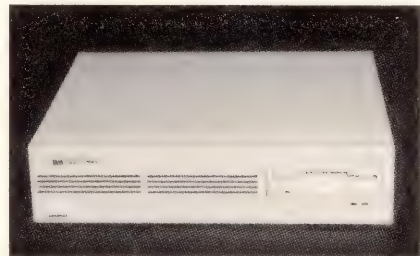
What if there is a pathname reference to another file in the current file you are editing? If you want to read that file, put the cursor on the file name or pathname, and issue **gf**, which means "get file," and that file will be

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loaded into a buffer. You also can move around by percentage of file: **20%** means jump to the 20 percent point in this file.

You can record macros, much like in emacs, with the **q<c>** command, where **<c>** is a buffer name from a-z. To re-execute the sequence of commands stored in the buffer, use **<c>** where **<c>** is the same buffer letter. There is even a command and filename completion function, to complete ex commands, and filenames for you, the **tab** key invokes the completion. Virtually all the keys are now valid vi commands, and many control sequences have been mapped also, as there are so many more commands in vim than vi.

Let's take a look at multiple windows and buffers. Yup, just like in emacs. You can start a single vim program running in a single terminal or terminal emulator window, and split the screen into multiple "virtual" windows, each showing a different file or different part of the same file. One could even be a shell access window. Every window shows a buffer, a buffer is typically a file, but you can have buffers loaded that are not displayed in a window (hidden buffer).

To open a new window, use the **:split [file]** command (or use **[CTRL]w[CTRL]s**). If you supply a filename, a new buffer is created, and the file specified is loaded. If no filename is supplied, another window viewing the same file is created. Once you have multiple windows open, you can move between windows with the **[CTRL]w** commands: **[CTRL]w [down-arrow]** or **[up-arrow]** to move up or down a window, and **[CTRL]w [CTRL]w** to cycle through windows. Windows can be sized with **[CTRL]w** followed by: - for smaller, + for bigger and = to make all windows the same size.

You can make a hidden buffer with

the **:close** command issued in a window. There is also the **:buffers** command which gets a list of all buffers, then you can load a hidden buffer into the current window with **:Nbuf** thus working with more buffers (files) than windows. Because you can act on many buffers, there are now "global"

commands called marks that remember which file they are placed in (upper case marks instead of lower case marks), and commands like: **:qall**, **:wall** and **:xall** to quit, write and exit from all buffers. It's similar to placing a bookmark — hey!

what a great name for them— too bad the documentation calls them marks.

This is only a brief overview of vim. So, where do you go for more information? Well, the good news is that vim is very well documented. There are several files breaking vim down into manageable pieces, and a rather large man page. The documentation is usually loaded into **/usr/local/lib/vim**.

So where do you get vim? Because it's in the public domain, you can get vim from the Internet. Additional information can be found on the Web. Here are some suggested ftp and Web sites to try:

ftp.tu-graz.ac.at
ftp.edvz.uni-linz.at
ftp.bhp.com.au/ana.ccs.deakin.edu.au
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Web Slinging Via The Microsoft Gates-way

By now, I'm sure you've heard Bill Gates telling you and everyone who would listen (and that's

practically the entire world) about Microsoft's Internet strategy, and his plans to make the Internet an extended member of Microsoft's application family. Not surprisingly, a number of industry insiders were skeptical. After all, this past fall, Wall Street investors flocked to Netscape Communications' IPO because it was the closest thing to owning stock in "the Internet." And while Netscape's stock was rising like a Saturn rocket, Microsoft's stock dropped like a burned-out meteor. On paper, Netscape now appears to have an overwhelming, if not insurmountable lead. And their momentum seems unstoppable. Why? Because popular wisdom holds that Microsoft lacks an Internet strategy.

But Microsoft didn't get where it is today by missing significant trends. And I have to believe that all the Internet excitement hasn't been a big surprise to Microsoft's marketing department. This spring, Microsoft will ship an http (hypertext protocol) server and an HTML (hypertext markup language) browser that will challenge Netscape for dominance of the server market (at least on Intel CPU-based

servers). And, with the kind of success that Windows NT is having in large corporations running on Intel-based servers, Microsoft is well-positioned for the high ground.

LOVE ME LIKE A ROCK

The product, Microsoft's Internet Server (code-named Gibraltar), features an http server, an ftp server and a gopher server, all managed from the same kind of "back office" application manager as the NT-based SQL Server. All three products install as NT services which, like daemons in HP-UX environments, start up every time your system reboots. This means that your server does not need to be logged in to serve Web, ftp and gopher clients. In other words, you don't need to be logged on for your NT Server system to be actively serving clients — even if your site has suffered a temporary power loss.

Microsoft's Web server features full security, full access to server-side CGI programming and full database connectivity that lets you use your ODBC, SQL Server or Access database for logging as well as for storage of Web documents. This database connectivity lets you use an external database for logging, but it also allows you to use the database as a repository for documents you want to serve. The Web supports standard scripting and CGI access, but it also supports Microsoft's own Internet Server Application Pro-



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gramming Interface (ISAPI) for more efficient programmatic customization of your Web site.

Security can be based on IP addresses, the NT Access Control List (ACL), NT usernames and passwords, or by using the Secure Sockets Layer (SSL) and RSA encryption. The server also provides support for Private Communication Technology (PCT), an enhancement and secure upgrade to the SSL protocol. Microsoft also intends to add Secure Transaction Technology (STT), developed jointly by Microsoft and Visa International, to support electronic payment technology. This integrated database connectivity positions Microsoft's Web offering as part of the full Microsoft BackOffice suite.

No Internet strategy? I don't think so.

The Microsoft Internet product suite also features an enhanced Web browser called the Microsoft Internet Explorer. It provides many of the browser enhancements such as table support and enhanced HTML, already included in Netscape's Navigator browser. And while Bill Gates may prefer Visual Basic (VB) as the scripting language, he has already stated that JavaScript will be in Microsoft's future. This makes it difficult for ISVs and IS development shops to know which way to go in building and deploying Web tools. Although JavaScript seems to be most promising as an industry solution, Microsoft's staying power can't be discounted, especially if they decide to emphasize VB.

GO, GO GOPHERS

The Microsoft Internet Server includes a full gopher server. Gopher is another of the popular Internet services that gives you the ability to create a full-blown information system. Originally developed at the University of Minnesota (the gophers), you can use gopher servers to locate and fetch (or go-for) information worldwide. With this, you can create your own gopher pages to publish ftp, Telnet, ASCII and other types of data sources worldwide. This lets you organize your information either for external Internet publishing or for internal "intranet" information stores. Microsoft

is one of the few providers of commercial gopher servers, and this stands to be a significant part of the suite for people who want to provide information in more than just Web pages.

ftp services has been part of Windows NT for some time. However, the new ftp server provides professional menu-driven system administration, logging and access control from the same kind of menu system as the Web service. It allows you to limit access to individual directories, easily create the messages and announcements within directories, and general control a secure ftp site. Clearly, Microsoft's Internet Server is meant to be a serious challenge to other http server software, but the fully integrated suite of applications shows that Microsoft is indeed planning to own the territory (so what else is new?). Expect to see Internet connectivity built into BackOffice products like SQL Server to end-user applications like Microsoft Word for Windows.

Nevertheless, the stock market is betting on Netscape, at least for now. Netscape was one of the earliest commercial http server providers to ship a product with full security. And they were certainly one of the first to provide cross-platform administration tools. A number of vendors, including O'Reilly and Associates' WebSite for Windows, Windows 95 and Windows NT, have easy-to-configure and easy-to-manage servers. But, few of them are as ubiquitous and platform-neutral as Netscape's product. And although Microsoft has announced its intentions, firm delivery dates are yet to be forthcoming. Still, when the smoke clears, I wouldn't be surprised to see Microsoft as the eventual winner in the Web-related products market. After all, profitability is what keeps companies going and I think Microsoft can and will be a profitable Web company.

—Miles, part of the mobile workforce, actually gets to live and work in Santa Clara, California — sometimes. But you can always reach him by E-mail at mbk@ideaeng.com, or visit his WWW home page at <http://www.ideaeng.com>.

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new Products

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Andataco

Andataco announced the Web Storage Manager which allows system administrators to monitor their company's network storage from anywhere there is Internet access. Using a Netscape 2.0 browser, administrators can set their URL to a host that has an Andataco Enterprise Storage Packaging (ESP) storage subsystem attached to it. An on-board computer in the ESP monitors all activity of the devices (tape, disk, RAID, CD-ROM) in the storage subsystem and reports this information back

to the Web Storage Manager.

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ATL Products Inc. introduced the ACL2/28 automated DLT library.

The ACL2/28 features two DLT4000 drives and 28 cartridges of 20 GB each, for a total capacity of 560 GB. With 2 to 1 data compression, the capacity exceeds 1 TB. Each of the two DLT drives supports a sustained data transfer rate of 1.5 MBps in native mode. With data compression enabled, the data rate doubles to 3 MBps.

Price for the ACL2/28 is \$33,000.

Contact ATL Products, 240 E. Palais Rd., Anaheim, CA 92805; (714) 774-6900.

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Cheyenne Software

Cheyenne Software Inc. announced Cheyenne Hierarchical Storage Manager (HSM) for UNIX. Cheyenne HSM for UNIX transparently migrates files between magnetic disk and optical disk libraries. It also provides automatic file migration, library management and high-speed backup.

Cheyenne HSM prices begin at \$9,500 for a 16-slot optical library support. Cheyenne HSM for UNIX is available for 20, 32, 56, 64, 99, 144, 160, 288, 432 and 576 slot libraries with prices ranging from \$11,600 for 20 slot support to \$91,500 for 576 slot support.

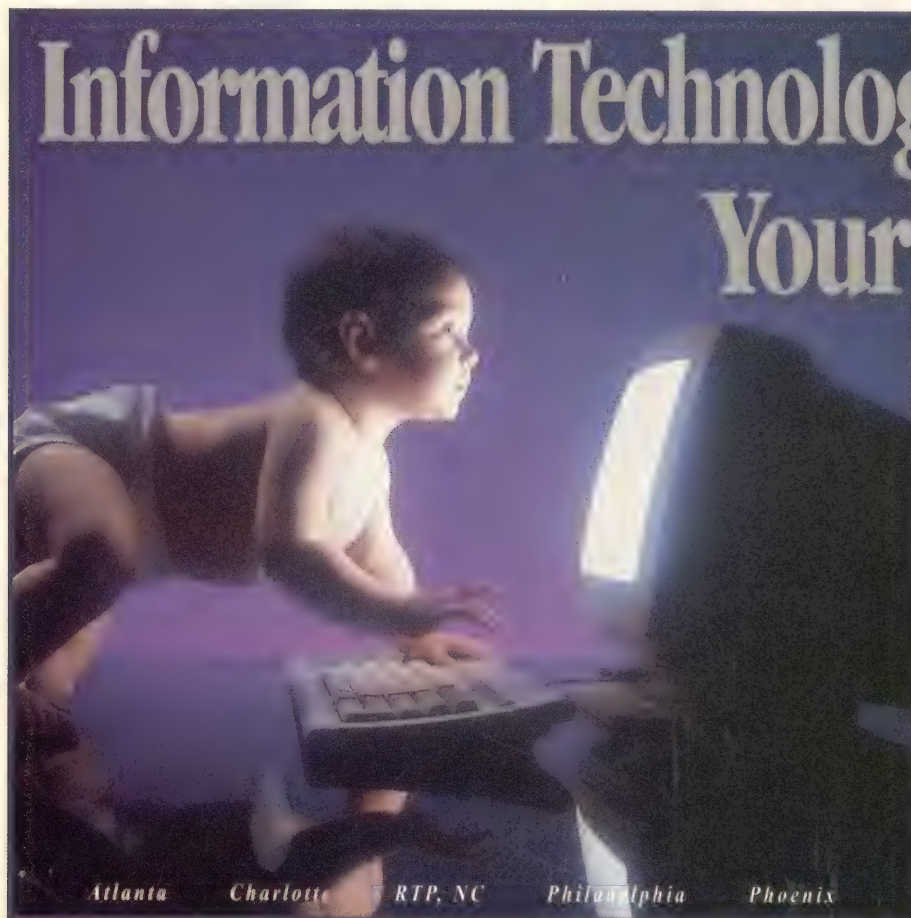
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An internal configuration costs \$449, and an external configuration costs \$600. Contact Conner Tape Products Group, 1650 Sunflower Ave., Costa Mesa, CA 92626; (714) 641-1230; <http://www.conner.com>.

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Kingston Technology

Kingston Technology announced price decreases on their workstation memory line for all HP, Sun, Silicon Graphics, IBM RS/6000 and DEC workstations. Kingston's 64 MB module for HP/ Apollo 750 workstations retails for \$3,395. Note that the HP equivalent module retails for \$4,160.

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Contact Kingston Technology Corp., 17600 Newhope St., Fountain Valley, CA 92708; (714) 435-2600; <http://www.kingston.com>.

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MDL's file server is up to seven times faster than common NFS file storage systems, supporting high-end data systems used for demanding applications such as online transactions. Features include less than 90 second system restart after a power failure, use of off-the-shelf Intel architecture platforms and a range of storage capacity from 3 GB to 5 TB.

Contact MDL Corp., 14940 N.E. 95th St., Redmond, WA 98052; (206) 861-6700; <http://mdlcorp.com/mdlcorp>.

Circle 374 on reader card

Platinum Technology

Platinum Technology Inc. released Version 2.1 of NetArchive-HSM and NetArchive-Backup.

NetArchive-HSM is a network-based system designed for heterogeneous environ-

ments. Anytime a migrated file is needed, NetArchive automatically and transparently restores the migrated file from the storage vault. A site-based server license starts at \$4,000, and increases as the amount of storage managed in the network increases. A site-based client license costs \$2,000 per operating system.

Both support HP-UX, SunOS and Solaris.

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Straight Talk



Andy Marken,
President
of Marken
Communications
Inc.

Large companies, small businesses and people with home offices are attracted to the Internet and the World Wide Web for many different reasons. But the goal is always related to gaining the edge that improved communications provides.

If all the promises of the Internet sound too good to be true, they may be. There are problems with the Net that the industry hasn't completely solved ... yet.

Ownership — The greatest strength of the Internet can also be its biggest problem — no one runs the Internet. Instead, groups of networks worldwide work together.

Approximately 100,000 networks connecting about 5 million computers (nearly 40 million users) in 103 different countries connect and interconnect to send and receive documents, data and images.

As the popularity of the Internet increases, the number of firms offering Internet connections continues to grow. Many of these organizations purchase bulk Internet service from providers with more robust backbones. Then, they resell service to individuals and small companies. Be sure to check out the history, financial strength, service, network capacity and capabilities of the Internet service providers you consider.

Security — As the largest shared data network in the world, the Internet, like any network, represents a serious security risk. Alternatives ranging from passwords to firewalls are available to protect your vital data from unwanted intrusion and computer viruses, however, users should be continually reminded that Internet E-mail isn't secure.

File Transport — Image-enhanced documents, spreadsheets and graphics can only be transported as formatted files if the sender and the recipient have the same operating system and applications software. Even inter-enterprise file transfers must often be sent in ASCII text form, because very few firms today have a single client-server operating system across their enterprise.

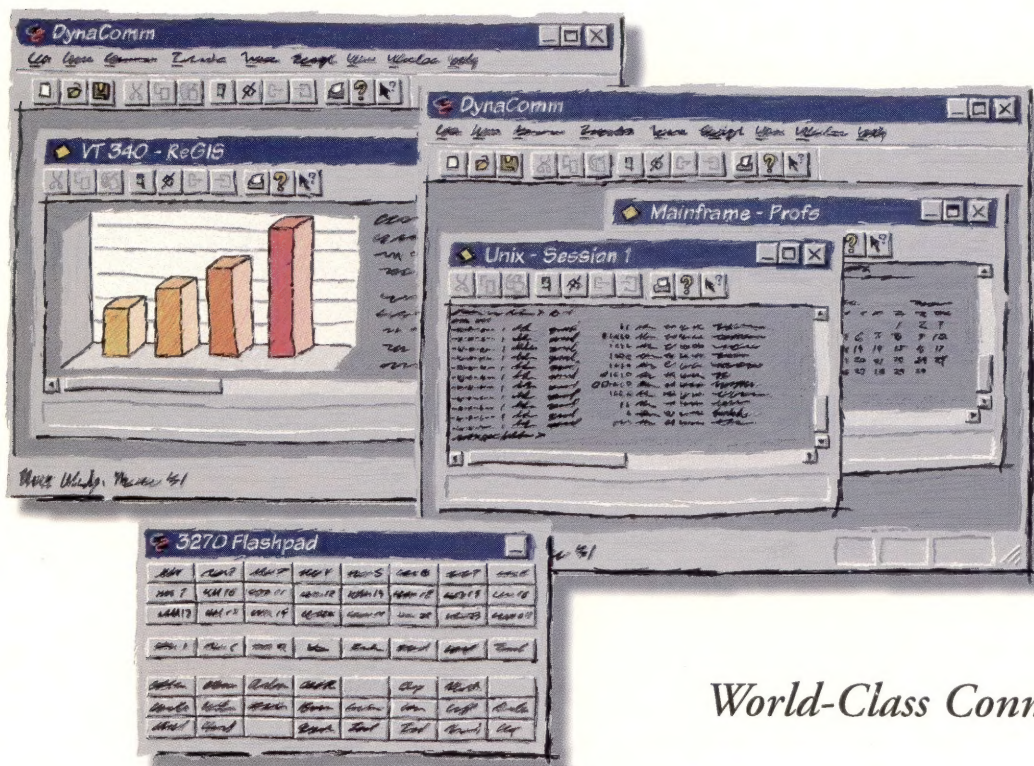
Navigation — Because of its ad hoc "design," the Web and Internet can be confusing to use. User-friendly Web browsers, people-oriented software front-ends and INet directories are being developed; but for the near future, it is up to you to find the search tools that are available, and then the company and information you need.

Delays — Because the Internet relies on so many different links, there are times when you will experience slow service. Of course, the same can be said for telephone or snail mail service, but when you become accustomed to immediate access and rapid response, it can be frustrating.

But remember, few things in the history of mankind have doubled in size every year. The Internet has been growing at this rate for the past few years, and will continue at this breathtaking pace for the foreseeable future. There are many issues surrounding the Internet that need to be resolved. But at this point, nothing else even comes close when it comes to giving a company or an individual an edge. — *Andy Marken is president of Marken Communications Inc. (Santa Clara, Calif.). He can be reached at (408) 986-0100 or marken@cerfnet.com.*

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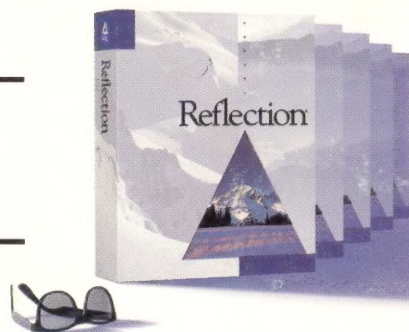
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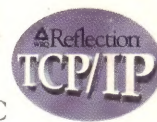
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